



# Prevalence of nocturnal enuresis among children in eastern region in Saudi Arabia

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**Citation**

Elham Alhifthy, Hussain Alghadeer, Tawfiq Aljubran, Hassan Alsahaf, Maryam Aljumah, Sawsan Alherz, Mohammed Ali Al Hewishel. Prevalence of nocturnal enuresis among children in eastern region in Saudi Arabia. *Medical Science*, 2021, 25(107), 67-75

## ABSTRACT

**Background:** Nocturnal enuresis can be defined as the inability to control urination and involuntary urination during sleep. Enuresis is a very common medical problem among young children. Enuresis is classified into different categories depending on the onset of the problem. It is not a condition that families should be afraid of, but we have to be aware of the impact that it can cause to the family and the child. We have also to be aware of the co-morbidities that can be associated with NE. **Purpose:** This study aims to estimate the prevalence and associated risk factors of nocturnal enuresis among children in eastern region in Saudi Arabia. **Material and methods:** This is a cross sectional study targeting parents and caregivers of children between 5-18 years old in the eastern region of Saudi Arabia. An online questionnaire which contains an informed consent has been used to collect the data. And the analysis was done using the SPSS program (statistical package for the social sciences) version. **Results:** The prevalence of NE was found to be around 48% in children between the age of 5-18 years old in the eastern region of Saudi Arabia. Prevalence of NE was reduced with increasing age but it was not significant statistically, also there was no significant difference between genders. The number of episodes was found to be 2-4 times weekly in Forty six percent of children, and (33.6%) had daily bed wetting. Most the children with NE had it only at nighttime (69.7%) and (30.3%) reported NE anytime during sleep. The majority of respondents who have a child with NE didn't make the choice to treat their child (59%). **Conclusion:** The study showed that almost half of the participants complaining of NE. with no significant association between NE and gender or sociodemographic status. Medical intervention was not the choice of most families participating in the study. Still there is no enough information about the causes and risk factors of NE so further researches needs to be done.

**Keywords:** Nocturnal enuresis, children, Saudi Arabia

## 1. INTRODUCTION AND BACKGROUNDS

Nocturnal enuresis is defined as the involuntary passage of urine during sleep in children who are more than five years of age (Nevéus et al., 2006; Goweda et al. 2020). The DSM V (Diagnostic and statistical manual of mental disorders V) defines NE as, involuntary or intentional Repeated voiding of urine into bed or clothes, at least twice a week and it should last for 3 consecutive months at least or the presence of clinically significant distress or impairment in social, academic (occupational), or other important areas of functioning in children older than 5 years of age. According to the diagnostic and statistical manual of mental disorders (DSM-5) it is called nocturnal enuresis when it occurs at night only. Enuresis is classified into a primary enuresis which is urinary incontinence in a child who has never been dry and if the child has been dry for at least 6 months then presented with urinary incontinence we call it secondary NE (Bakhtiar et al., 2014). NE is present among 15–20% of 5 years old children, 5% of 10 years old children and 1% of teenagers. With a variety of gender affection despite being more frequent among boys (Karničnik et al. 2012). Concerns become apparent when children reach the age of school enrolment. The majority of children 80–85% with NE are mono-symptomatic, while 5–10% of cases meet the definition of primary enuresis, with daytime wetting or other bladder symptoms (Lawless & McElderry, 2001).

Although NE is not a serious medical disorder, it is a common problem of childhood and can lead to significant stress within the family. There are multiple impacts on the children and families which can be associated with NE. It may cause the child to have a low self-esteem or be aggressive, and other impacts on his behaviours, psychological and social life. Therefore, identifying children who have NE or being at risk is essential to perform therapeutic measures (Bakhtiar et al., 2014; Gür et al., 2004). Based on the results of various investigations the enuresis causes are developmental differences e.g. differences in the growth of the urinary sphincters of a child and various diseases like urinary tract infection, diabetes mellitus. Other risk factors include emotional changes and conflicts such as the birth of a new baby, educational stressful conditions, parental separation, family conflicts and moving to a new city (Bakhtiar et al., 2014; Gür et al., 2004; "Nelson Textbook of Pediatrics Elsevier eBook on VitalSource, 20th Edition" n.d.; Yeung, 1997). There are multiple comorbidities to the NE. Those comorbidities including neuropsychiatric problems like intellectual disability, attention deficit hyperactivity disorder (ADHD), psychological disorders, and low self-esteem. Urinary tract infections, obstructive sleep apnea, diabetes, and low hormones as ADH deficiency, are other disorders known to be associated with NE 10 also (Elgohary, Shalanda, 2013; Von Gontard et al. 1999). So, it is fundamental to recognize NE and look for associated symptomatology.

Careful literature research has found into the global prevalence of NE showed different results within different countries. In Turkey, the prevalence of NE was found to be 8.9%, out of which 7.75% was primary nocturnal enuresis (Unalacak, et al. 2018). The prevalence rate is 4.7% in China (Wen et al. 2006) and 18.2% in Australia (Sureshkumar et al. 2009). In the US, a representative sample of 8–11 years old children showed a prevalence of NE of 4.45%, the largest prevalence was in 8 years old children (Shreeram et al. 2009). There was a study measuring the global incidence of enuresis in children between 6–12 years of age and it was shown to be 15%–25% in one study (Nevéus et al., 2006). Multiple studies were conducted in Arab countries with different results. In Egypt, NE was found to be 18% among children  $9 \pm 2$  years old. The same study shows that the number of siblings of  $\geq 4$  and birth order  $\geq 3$ , deep sleeping pattern, caffeine consumption, and exposure to problems/violence correlated positively with the occurrence of NE. It showed also that socioeconomic status, family history, presence of other diseases as urinary tract infection (UTI), respiratory tract infection, fits, anal itching, pinworm infestation, and constipation has a significant association with NE (Hamed, Yousf, & Hussein, 2017). Another study conducted among primary school children in Al-Mukalla City, Yemen, found NE in 28.6% of children, with a predominance of girls, and the prevalence decreased with increasing age (Aljefri et al., 2013). In the Kingdom of Saudi Arabia, a study conducted in 2017 in Riyadh among children in the primary health care centre, the prevalence of NE was 18.5% among families with a higher prevalence in boys. There was a reduction in the prevalence of NE with increasing age. with many children found to have stressful events in their life other than parents' divorce (Alshahrani, Selim, & Abbas, 2018). A recent study in Saudi Arabia found that the prevalence of NE within different cities reported that 31.2% of children suffer from nocturnal enuresis, but without significant correlations between nocturnal enuresis and child gender. There was a significant correlation with child age and family history of NE in parents or siblings (Alhifthy et al., 2020).

There are few studies conducted on NE in Saudi Arabia and up to now, there is no study conducted on it in the Eastern region in Saudi Arabia. Therefore, this study aims to estimate the prevalence and identify the risk factors of NE among children in the eastern region in Saudi Arabia. Considering that there is a lack of studies in this region about such an important medical condition with many consequences.

## 2. STUDY METHODOLOGY

### Study design and population

A cross-sectional study was conducted among caregivers of children in the ages of 5–18 years in the Eastern region of Saudi Arabia.

### Sample size and sampling strategy

A sample size equal to 505 caregivers responded to the online questionnaire.

### Data collection

The data were collected from the parents and caregivers by using an online questionnaire and an informed consent obtained at the beginning. Ethical approval was obtained from the IRB (institutional review board) of Princess Nourah bint Abdulrahman University (IRB registration number with KACST, KSA: H-01-R-059). The questionnaire collected sociodemographic characteristics, frequency, time, and the factors possibly associated with NE among children.

### Data analysis

Data were analysed through the Statistical Package for the Social Sciences (SPSS). Mean and standard deviation used to calculate the continuous data, frequencies, and percentages for categorical data and Chi-square were considered statistically significant at P values <0.05.

### Data management

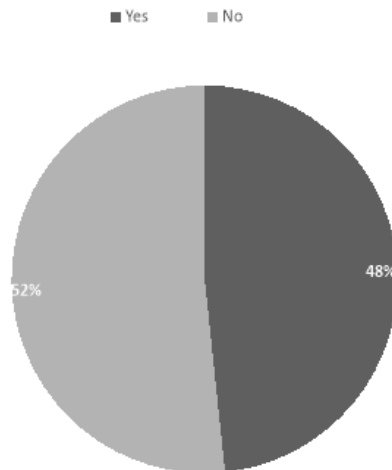
Data is stored in a database on a safe computer within an encrypted file, and it is only showed to the research team. Privacy and confidentiality maintained under all circumstances.

## 3. RESULTS

A total of five hundred and five (505) participants were included in this study. Males represented 62.2% of the sample and the majority of the respondents have children between 5-7 years of age (36.6%) followed by 8-10 years (30.9%). First born children represented almost a third of the sample (30.9%) and 2<sup>nd</sup> born were almost fifth of the sample (21.6%). Table 1 describes the sample characteristics in more details. The majority of the children were living at a 4-6 household size (59%). Nocturnal enuresis was reported in 48% of respondents' children (Figure 1).

<b>Table 1</b> Sociodemographic data among the study participants. (N=505)		
	Variables	Frequency (%) Total 505 (100%)
Having a child with NE	Yes	244 (48.3%)
	No	261 (51.7%)
Gender	Male	314 (62.2%)
	Female	191 (37.8%)
Child age	5-7 years	185 (36.6%)
	8-10 years	156 (30.9%)
	11-12 years	72 (14.3%)
	13-15 years	45 (8.9%)
	16-18 years	47 (9.3%)
Birth order of the child	1	156 (30.9%)
	2	109 (21.6%)
	3	77 (15.2%)
	4	66 (13.1%)
	5	46 (9.1%)
	6	31 (6.1%)
	7	11 (2.2%)
	8	9 (1.8%)
Type of delivery	Vaginal	400 (79.2%)
	Caesarean section	105 (20.8%)
Gestational age (months)	Less than 7 months	13 (2.6%)
	7 months	8 (1.6%)
	8 months	36 (7.1%)

	9 months	448 (88.7%)
Household size	3	58 (11.5%)
	4-6	298 (59%)
	More than 6	149 (29.5%)
Sleeping status	Light	259 (51.3%)
	Deep	246 (48.7%)



**Figure 1** Prevalence of Nocturnal Enuresis

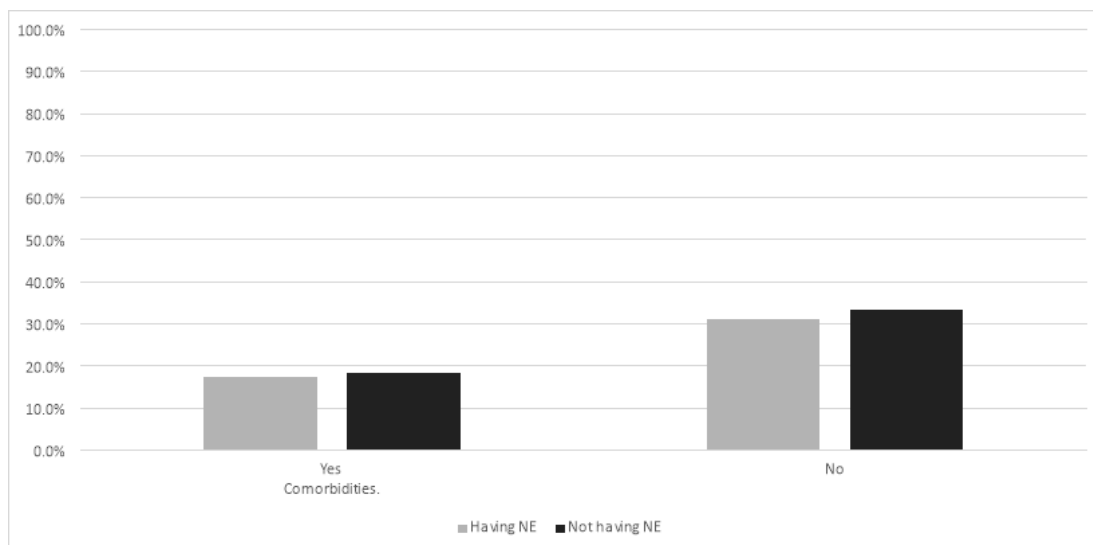
Amongst children who have NE, 46.4% had 2-4 episodes of bedwetting per week and 33.6% had daily bed wetting while the majority of children did not have a specific time during sleep where they would pass urine (45.1%), more than a third (38.5%) report NE after long period of sleep. Around 30.3% of children reported day time enuresis in addition to the NE and only 18.9% of our sample presented with secondary NE (Table 2). Comparison of children with and without NE showed no significant correlation with gender, type of delivery of gestational age at delivery, family history of NE or increased fluid intake at night. No significant difference was found for comorbidities (Table 3). Most of our respondents who have a child with nocturnal enuresis were not trying anything type of treatment (59%), and (29.6%) tried behavioral modifications. No one underwent surgical treatment (Table 4). NE was not found to be significantly associated with any of the questioned comorbidities ( $p > 0.05$ ) (Figure 2).

<b>Table 2</b> Frequency and time characteristic among children with nocturnal enuresis (N=244)		
Frequency of NE	Daily	82 (33.6%)
	2-4 time weekly	113 (46.3%)
	Once weekly	20 (8.2%)
	1-2 time monthly	29 (11.9%)
Time of NE during sleep	After short period of sleeping	20 (8.2%)
	After long period of sleeping	94 (38.5%)
	Any time	110 (45.1%)
	More than once in a day	20 (8.2%)
Presence of diurnal enuresis	At night-time	170 (69.7%)
	At night-time and daytime	74 (30.3%)
Primary enuresis	Yes	46 (18.9%)
	No	198 (81.1%)

<b>Table 3</b> Sociodemographic and risk factors correlated with nocturnal enuresis (N=505)					
Variable	Responses	Nocturnal enuresis		Total (N=505)	P value
		Yes (n=244)	No (n=261)		
Gender	Male	149 (61.1%)	165 (63.2%)	314 (62.2%)	0.618
	Female	95 (38.9%)	96 (36.8%)	191 (37.8%)	
Child age	5-7 years	96 (39.3%)	89 (34.1%)	185 (36.6%)	0.295
	8-10 years	67 (27.5%)	89 (34.1%)	156 (30.9%)	
	11-12 years	31 (12.5%)	41 (15.7%)	72 (14.3%)	
	13-15 years	24 (9.8%)	21 (8%)	45 (8.9%)	
	16-18 years	26 (10.7%)	21 (8%)	47 (9.3%)	
Birth order of the child	1	77 (31.6%)	79 (30.3%)	156 (30.9%)	0.469
	2	44 (18%)	64 (24.9%)	109 (21.6%)	
	3	44 (18%)	33 (12.6%)	77 (15.2%)	
	4	31 (12.7%)	35 (13.4%)	66 (13.1%)	
	5 and more	48 (19.7%)	49 (18.8%)	97 (19.2%)	
Type of delivery	Vaginal	194 (79.5%)	206 (78.9%)	400 (79.2%)	0.872
	Caesarean section	50 (20.5%)	55 (21.1%)	105 (20.8%)	
Gestational age (months)	Less than 7 months	3 (1.2%)	10 (3.8%)	13 (2.6%)	0.242
	7 months	3 (1.2%)	5 (1.9%)	8 (1.6%)	
	8 months	16 (6.6%)	20 (7.7%)	36 (7.1%)	
	9 months	222 (91%)	226 (86.6%)	448 (88.7%)	
History of parents with same condition during their childhood	Yes, both (mother, father)	9 (3.7%)	12 (4.6%)	21 (4.2%)	0.819
	Yes, only father	27 (11.1%)	23 (8.8%)	50 (9.9%)	
	Yes, only mother	29 (11.9%)	32 (12.3%)	61 (12.1%)	
	No	179 (73.4%)	194 (74.3%)	373 (73.9%)	
Sibling suffering from the same condition	Yes	82 (33.6%)	68 (26.1%)	150 (29.7%)	0.094
	No	134 (54.9%)	168 (64.4%)	302 (59.8%)	
	Not having siblings	28 (11.5%)	25 (9.6%)	53 (10.5%)	
Circumcision of the child	Yes	149 (61%)	165 (63%)	314 (62.4%)	0.610
	No	0 (0%)	0 (0.0%)	0 (0.0%)	
	Child is female	95 (39%)	96 (37%)	191 (37.8%)	
Increase fluid intake at night	Yes	143 (58.6%)	161 (61.7%)	304 (60.2%)	0.480
	No	101 (41.4%)	100 (38.3%)	201 (39.8%)	
Child suffered from comorbidities	Yes	87 (35.7%)	92 (35.2%)	179 (35.4%)	0.924
	No	157 (64.3%)	169 (64.8%)	326 (64.6%)	

**Table 4** Multiple response set for the treatment options used by the families for NE (n=244)

Methods of treatment	Behavioural modification	79 (32.4%)
	Bedwetting alarm	8 (3.3%)
	Exercises to strengthen the bladder muscles	3 (1.2%)
	Pharmacological treatment	19 (7.8%)
	Surgical treatment	0 (0%)
	Not trying anything	157 (64.3%)



**Figure 2** Comorbidities correlation with nocturnal enuresis ( $P=.924$ )

#### 4. DISCUSSION

Nocturnal enuresis (NE) is a common problem of childhood all over the world that can cause trouble for children and their families ("APA - Diagnostic and Statistical Manual of Mental Disorders DSM-5 Fifth Edition," n.d.). This study estimated the prevalence of nocturnal enuresis and the associated risk factors, and comorbidities among children aged 5-18 years old in the Eastern region of Saudi Arabia. The prevalence of having a child with nocturnal enuresis in the Eastern region of Saudi Arabia was around 48.3% and the prevalence was higher among boys although the difference did not reach statistical significance. A close prevalence rate of (31.4%) was reported in a country wide study done in Saudi Arabia and included 2148 responses. Similarly, they did not show a significant difference between boys and girls (Alhifthy et al., 2020). A study performed in a tertiary military hospital in Riyadh , Saudi Arabia reported a much lower prevalence of NE in Riyadh city, Saudi Arabia (18.5%) with higher prevalence in boys (Alshahrani et al., 2018). This was closer to the results reported by Awn and his group from Bahrain, who reported a prevalence of 11.1% amongst children 5-12 years of age but with no significant difference with gender (Ahmed Awn et al., 2018). However, in Jazan, Saudi Arabia reported much higher prevalence in their area of 76.4% among 5-12 years old children had NE (Sherah et al., 2019). In Yemen, the reported a prevalence was 28.6% of children in Al Mukalla city had NE with a significantly higher prevalence in girls (Aljefri et al., 2013). The differences in prevalence could be related to different sample size, target population or sampling method.

In our study, we found that the highest prevalence was within children aged 5-7 years old (36.6%) and it decreased as age increases with a small increase in prevalence in children aged 16-18 years (9.3%) from those 13-15 years old (8.9%). Alshahrani et al. (2018) reported similar age distribution, the highest rate was in children aged 5-6 years (43.5%) and it decreased as children grow. Reduction of prevalence as age increased was also found by Alhifthy et al. (2020). In another study conducted on 1576 child aged between 6 and 16 years in Turkey, The relationship between the prevalence of enuresis and the age of the child was significant (Gür et al., 2004). In contrast, Sherah et al. (2019) in Jizan, Saudi Arabia reported the highest prevalence rate in the age group between 9-12 years (85.6%) and the lowest prevalence was found in the 5-year-old children (64.0%). In Bahrain, the study from Awn et al that was conducted in local health centers among children aged 5-12 years showed no significant difference in the frequency of NE as the age increased (Ahmed Awn et al., 2018). Similar to our study, some studies found that the majority of children have isolated NE without diurnal enuresis (DE). Pandey et al., (2019) reported that only 17.9 % of their NE children had DE, which is similar to Hamed et al. (2017)'s result of 16%. In the other side, a study from Alhifthy et al. (2020) conducted in Saudi Arabia showed that (55.1%) of the patients had enuresis at day and night time and 43.9% occurred at night only. The frequency of NE varied between children with NE. We report that the majority of our children passed urine more than twice per week (79.9%). This was very similar to Alshahrani et al. (2018) with the 82.2% of their sample having 3 or more episodes weekly and to Alhifthy et al. (2020) with a 94% of the sample having > 2 episodes per week. Pandey et al. (2019) reported that only 37.8% of their children with NE had more than 2 episodes a week and Hamed et al. (2017) reported a frequency of more than twice per week in 55.9%. According to our result, the relationship between developing nocturnal enuresis and the overall sociodemographic status such as birth order of the child ( $P = 0.469$ ), type of delivery ( $P = 0.872$ ) and age of gestation ( $P = 0.242$ ) of the child, and history of parents with the same condition during their

childhood ( $P = 0.819$ ) is not significant statistically. Multiple studies reported that there is no significant relation between parents' level of education and the prevalence of NE which is similar to our study.

Gür et al. (2004) reported that there was no relationship between the enuresis prevalence and the educational level of the mother. Another study was conducted in Netherlands on 5360 children reported that there is no significant relation between the educational level of parents and the prevalence of nocturnal enuresis (Spee-van Der Wekke et al., 1998). In contrast, Bakhtiar and his group reported significantly higher rate of NE in mothers with lower levels of education (Bakhtiar et al., 2014), but no significant relationships to divorce, family history of NE, breast feeding, child's academic failure, birth of a new baby, change in place of residency, the age of the child, the order of the birth of the child, level of education, the mother age, the father age, size of the family, death of one of the parents, number of siblings, parental occupation, paternal education, parental kinship and child's hyperactivity ( $P > 0.05$ ) (Bakhtiar et al., 2014). Hamed et al. (2017) reported significant relation of the occurrence of NE to family history of NE, father's level of education and work status, mother education, number of children per room, and socioeconomic status. In china, a significant relationship was found with lower maternal education and maternal unemployment, divorce, maternal tobacco use during pregnancy and paternal addiction. Other studied socioeconomic factors did not reach statistical significance (Pandey et al., 2019).

Results varied in the type of management used for NE from nothing, to any of the modalities of behavioral intervention to pharmacological treatment. In our study, around 32% used behavioural modification techniques while the majority (64.3%) of the respondents were not trying anything to manage their child's NE. Only 3.3% of the participants used bedwetting alarm, 1.2% of the participants try exercises to strengthen the bladder muscles and 7.8% of the participants had some sort of pharmacological treatment. Pandey et al. (2019) had similar results to ours as they showed that 79% had not done any type of intervention to their children and only 13.2% had some sort of behavioural intervention. In Egypt, in Sohag and Qena Governorates, a study found that families did no intervention in most cases and that behavioural treatment was used in 16.7 % (Hamed et al., 2017). Alhifthy et al. (2020) reported that families used behavioural modifications, bed wetting alarm and bladder exercises in 31.6%, 6.8% and 6.2% respectively. In their sample 29% had pharmacological treatment.

## 5. CONCLUSION

Our study provides information about the prevalence of NE among children in the Eastern region of Saudi Arabia. There is variability in the prevalence of NE in Saudi Arabia. Our study estimated the prevalence to be 48%. There was no statistically significant association between having NE and gender or the overall sociodemographic status. Most families did not do any intervention. Further research needs to be done to identify causes of wide variability in the distribution of NE in different areas of Saudi Arabia and its associated factors.

### Abbreviation and Acronyms

NE: nocturnal enuresis

### Ethical consideration and Issues

For study protocol/study design/methodology: the study was approved by the medical ethics committee of princess Nourah bint Abdulrahman University (ethical approval code: 20-0263).

### Authors Contribution

Elham alhifthy: Writing the proposal, review of the manuscript

Hussain Alghadeer: writing the proposal, data collection, data entry and analysis with review of the manuscript.

Tawfiq Aljubran: writing the proposal, data collection, data entry and analysis with review of the manuscript.

Hassan Alsaahaf: writing the proposal, data collection, data entry and analysis with review of the manuscript.

Maryam Aljumah: writing the proposal, data collection, data entry and analysis with review of the manuscript.

Sawsan Alherz: writing the proposal, data collection, data entry and analysis with review of the manuscript.

Mohammed Ali AlHewishel: writing the proposal, data collection, data entry and analysis with review of the manuscript.

*All authors declare the following: Payment/services info:* All authors have declared that no financial support was received from any organization for the submitted work. *Financial relationships:* All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work. Other





relationships: All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

### Funding

This study has not received any external funding.

### Conflict of interest

The authors declare that there are no conflicts of interest.

### Informed consent

Written and oral informed consent was obtained from all individual participants included in this study. Additional informed consent was obtained from all individual participants for whom identifying information is included in this manuscript.

### Acknowledgements

We thank the participants who were all contributed samples to the study.

### Data and materials availability

All data associated with this study are present in the paper.

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#### Peer-review

External peer-review was done through double-blind method.

#### Article History

Received: 03 December 2020

Reviewed & Revised: 04/December/2020 to 05/January/2021

Accepted: 06 January 2021

E-publication: 12 January 2021

P-Publication: January 2021

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